Enhancing Continuity in Care: An Implemantation of the ASTM E2369-05 Standard Specification for Continuity of Care Record in a Homecare Application

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Abstract

Sharing of healthcare related information among the different healthcare providers is a crucial aspect for the continuity of the provided care The purpose of this study is the presentation of a system appropriate to be used upon the transition or the referral of a patient, and especially in transition from hospital to homecare. The function of the developed system is based upon the creation of a structured subset of data, concerning the most relevant facts about a patient's healthcare, organized and transportable, in order to be employed during the post-discharge homecare period, enabling simultaneously the planning and the optimal documentation of the provided homecare. The structure and the content of the created data sets are complying with the ASTM E2369-0 Standard, Specification for Continuity of Care Record.

Keywords: Continuity of Care, Homecare, Delivery of HealthCare, Treatment Cost, Medical Record Systems, XML.

Introduction

It is highly anticipated that the continuous evolution of Information Technology, in combination with the increase of mean life expectance and the hospital care cost avalanche, will eventually alter the way that health care is going to be delivered, and, in the near future, a significant proportion of health care will be provided in outpatient, community and homecare schemas. Nevertheless, as we move towards this decentralized model, well argued concerns are raising about the fragmentation of patient's relevant information and the discontinuity in the delivered care. Furthermore, especially in transitions from hospital to homecare, crucial questions emerge concerning the way this specific kind of care will be medically supervised and financially reimbursed.

It is generally expected that the Electronic Health Record will facilitate and simplify the exchange of information between different care providers and agencies, improving the quality and continuity of care. Nevertheless, a number of questions arise concerning the scope and the level of detail of information that should be exchanged when a patient is referred to a different care provider, especially in the case of transition from hospital to homecare.

ASTM, an American National Standards Institute (ANSI) standard development organization, has recently approved the E2369-05, Standard Specification for Continuity of Care Record (CCR) [1]. CCR is intended to assure at least a minimum standard of health information transportability when a patient is discharged, referred or transferred, fostering thus and improving continuity in care.

We have previously reported [2] the conceptualization and initial design of a system that creates a structured subset of data, concerning the most relevant facts about a patient's healthcare, organized and transportable, in order to be employed during the post-discharge homecare period. In this article we report the actual development and implementation of the system according to the ASTM-CCR Specification. The developed system enables simultaneously the planning and the optimal documentation of the provided homecare, while, at the same time, it allows for the acquisition of relevant financial data, aiming to facilitate the appropriate remuneration of the offered services.

Methods

E2369-05, Specification for CCR: The CCR could be described as a proposed standard for an electronic form for patient transfer, referral, and discharge. Rather than a complete patient record, the CCR is designed to provide a snapshot in time containing the only the most relevant / important clinical, demographic, and administrative data for a specific patient.

The CCR consists of three core components, the header, the body and the footer, each one consisting by a number of sections, covering the most important aspects of a patient's health condition. The sections consisting the CCR include: Patient and provider information; Insurance information; Patient's health status (allergies and other alerts, medications, medical equipment / external medical devices used by the patient, immunizations, vital signs, results, and recent procedures); Recent care provided and Recommendations for future care (care plan).

The CCR is designed to be technology and vendor neutral for maximum applicability. It must be developed on the extensible markup language (XML) platform in order to offer multiple options for its presentation, modification, and transmission.

It is expected that the widespread use of the CCR will improve continuity of patient care, enhance patient safety, reduce medical errors, reduce costs, enhance communication and exchange of health information and standardize patient care information across healthcare providers. It is actually anticipated that CCR will facilitate and stimulate more rapid Electronic Health Record (EHR) development, as an essential and simple building block.

Apart from ASTM, other standards development organizations are also trying to facilitate the exchange of clinical information among healthcare providers. The predominant standard in this field is the HL7 Clinical Document Architecture (HL7-CDA) [3]. The HL7-CDA has a larger scope than CCR, accommodating any kind of medical document, supports templates for specific use cases, allows user defined fields and encourages the use of standard components, like data types [4]. CCR on the other hand, focuses on patient summary information and is actually less extensible than CDA, since it does not allow any user-defined fields.

Nevertheless, we believe that the concrete objective and the relative simple implementation of the CCR render it the most suitable tool for the current application. Furthermore, CCR's prevention of local differences in implementation, which is enforced by the disallowance of user-defined fields, was actually evaluated as an advantage. This is due to the fact that in countries like Greece, where there is not presently an official approach to the EHR, loosely rules

regarding the content and the format of the data could actually complicate data exchange among care providers.

System description: The developed system consists of two modules. The first module allows for the creation of a typical CCR that contains the appropriate demographic, administrative and relevant clinical data, while the second module enables the creation of a homecare plan which is included in the Care Plan section of the CCR. The system is intended to be used upon the transition of a patient from hospital to homecare, although the first module alone could actually be used in any case of transition or referral.

The typical–CCR module generates the appropriate CCR files from an already installed EHR system. The CCR files are created by the appropriate collection of data from the corresponding tables of the local database and are stored in the local database as an XML blob. The mapping of the various fields of the local database into the corresponding CCR components is made through a mapping table, which is employed as a single Microsoft Excel table and contains a simple one – to –one transformation of the database fields and the CCR components. In the absence of an EHR system the typical–CCR module can be used as a standalone application, allowing for the users to enter manually the necessary data. In any case, the user decides which parts of the patient's medical record (electronic or paper) are the most significant ones or are the necessary ones for the description of the current health status of the patient and should be included in the CCR.

The second module is responsible for the creation of the homecare plan by creating a structured subset of data, containing the diagnostic, monitoring, treatment
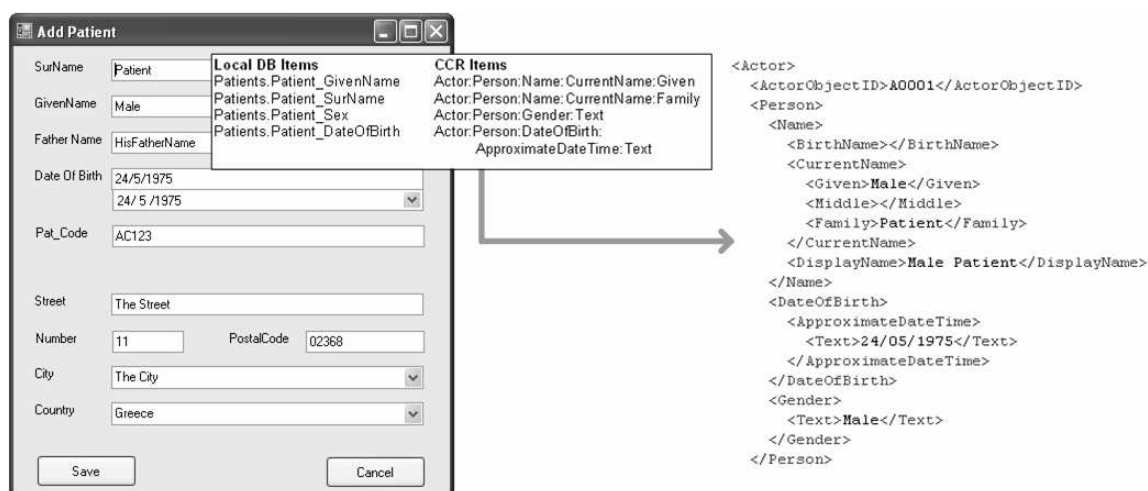

Figure 1: Transformation of Local DataBase items to CCR components

and nursing activities that should be employed during the post-discharge home-care period. The design of this module is based on the concept that homecare should offer not only well organized nursing care, but a structured approach to total care delivery. Thus, homecare should also include visits of medical personnel of the appropriate specialties, systematic monitoring of physiological parameters, systematic self-reported information of the status of the patient by the patient himself and / or his relatives, a number of therapies that can be actually carried out in the home environment, like physical and respiratory therapy and so on. In order for these tasks to be fulfilled, homecare planning should be both patient–specific and diagnoses–related.

In order to facilitate and automate the creation of diagnoses-related homecare plans, the developed system allows for every Hospital Department or Medical/Nursing group, to individually assign an appropriate set of homecare activities to specific diagnoses codes that are coded according to Diagnosis Related Group (DRG) codification. These activity sets consist of diagnostic, monitoring and treatment activities that can be actually performed in home-environment, together with an appropriate nursing – activity treatment plan. These profiles of home-care activities are custom-made and every user, i.e. every physician responsible for discharging a patient from hospital, is actually able to set up his own profiles.

Upon the actual discharge of a patient the physician can use one of the predefined profiles, create a new one or modify an existing one in order to adapt his home-care profiles to specific instances and to emerging new demands. The scheduled procedures are automatically inserted in the CCR in the section of Care Plan.

It should be mentioned here that during the formation of these profiles the user can attach to each activity a set of nominal fees. This set of fees consists first of the official Insurance Agencies reimbursement amount, which in Greece is in most cases much lower than the actual cost of the services provided, and, second, by a currently valid financial rate. This later is estimated by a software tool that we have already developed and allows for a rational approximation of the effective mean cost for several elementary medical activities, over different medical specialties [5]. Thus, the developed system ignites, when relevant, the corresponding revision of an implicitly associated latent financial record that allows for an approximation of the individual case-cost.

However, the system, apart from producing, electronically or in paper – format, the CCR, also produces a number of additional forms, including advisory and informational notes for the patient himself or for his relatives and diagrams of physiologic measurements, such as glucose, blood pressure etc. that the patient should monitor. The system also provides for the production of forms that will be filled by the nursing personnel during the visits in order to document their activities. These forms include a detailed schedule of the planned

Figure 2: Homecare activities selection for a specific patient

Figure 3: XML to HTML transformation of the produced CCR.

visits, which indicates the activities and / or interventions that the nursing personnel should perform during each visit and must be later filled in with the actual outcome of the visit.

The filled forms, both the ones regarding the nursing activities and interventions and the ones regarding the monitoring of physiological parameters, are returned to the responsible physician who evaluates them and, depending on his evaluation, can modify the care – plan of the specific patient as he deems necessary.

The structure and data of the produced CCR are complying with the ASTM E2369-05 Specification for CCR, while XML is used for the representation of the data. The XML representation is made according

to the W3C XML schema proposed by ASTM [6]. The CCR that is produced by the system is currently automatically transformed to HTML format, using the Extensive Stylesheet Language (XSL), in order to be viewable and printable.

It should be mentioned here that the diagnostic and treatment activities are classified according to International Classification of Diseases Version 9 (ICD9), while the Australian Refined DRGs (AR-DRGs) have served for the case codification, since DRGs have not yet been introduced in the Greek National Health System and the Nursing Interventions taxonomy of the Clinical Care Classification (CCC) system [7] was used for the documentation of nursing activities.

Implementation and Evaluation
The system developed is currently being laboratory tested with an EHR system that has been developed by our team. The laboratory implementation indicates that the system, whether interfaced to an EHR or not, is stable enough for practical use and it actually provides a simple, effective and easily expanded tool for the formation of both a CCR and a homecare plan, offering at the same time a good approximation of the individual case cost and a flexible HTML format for data representation.

The implementation of the ASTM-CCR Specification Standard confirms that the specific protocol ensures indeed easy document production and manipulation while, at the same time, it assures at least a minimum standard of health information transportability. XML has proven to be the appropriate technology for such an application, since it renders the presentation of information flexible and generic enough to adapt to various users and various software platforms, with minimal custom programming.

Nevertheless, there are some issues concerning the actual use of the CCR. The main one is the fact that, since the physician in charge is actually responsible for the selection of the appropriate / relevant clinical data that should be included in the record, there is always the possibility for the record to become information–polluted by unnecessary data. We believe that the establishment of diagnosis–specific pathways for the formation of special profiles that will support the physicians upon selecting the appropriate data could facilitate the use of CCR and prevent its main characteristic which is its summarized schema.

Discussion
Nowadays, that healthcare delivery process is rapidly evolving to a decentralized model,

encouraging especially community and homecare schemas, sharing of healthcare related information among the different providers has become a crucial aspect for the quality and the continuity of the provided care. The proposed solution utilizes the ASTM E2369-05 Standard Specification for Continuity of Care Record and the XML technology for the creation of a structured subset of data, concerning the most relevant facts about a patient's healthcare, organized and transportable, in order to be employed during the post-discharge homecare period, enabling simultaneously the planning and the optimal documentation of the provided homecare.

We strongly believe that the long term use of CCR will stimulate the Electronic Health Records development by facilitating its shaping of content. This is especially true for some countries, including Greece, where there is not presently, an official approach to the EHR. According to the proposed standard, CCR aims to assure a minimum standard of health information transportability and must be easily produced using, if possible, readily available software. These features provide that even medical personnel that are not very familiar with using computer programs will relatively easily adopt it and, most important, data collected from CCR can actually form the basis for EHR standard requirements and development.

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